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RETROSPECTIVE.

In this, the first issue of the JOURNAL for 1884, we propose to glance hastily over matters of interest affecting those engaged in the pursuit of the gas industry, in order that we may see what has been attempted in the past year, and to trace out what should be done in this year, towards lessening the cost of the gas makers' product.

In the first place it may be asserted, without fear of contradiction, that the business of the American gas manufacturer has never before experienced a more prosperous year than that which closed with the 31st day of December, 1883. Indeed, so great has been the demand for illuminating gas that the energies of many of our engineers and superintendents have been sorely taxed to enable them to comply with the extraordinary and repeated calls made upon them. It is certainly a very satisfactory condition of things to be called upon to chronicle; and is also an excellent refutation of any assertion that new methods of artificial illumination have made, or even threaten to exert, any appreciable difference on the outline of the field of the industry which owes its real discovery to William Murdoch, and the first practical public application of which is less than a century old. The electricians of the present day, with all the leverage of science, untiring effort, and unlimited capital, to back them, in their attempts to place before the public a satisfactory substitute for gas illumination, have signally failed in their endeavors—and the home of its birthplace, the Avenue de l'Opera (Paris, France), where the Jablochkoff candle first publicly showed its uncertain, moonlike rays, not much over five years ago, has returned to its first allegiance, and gas has resumed its sway. An extract from the letter of an esteemed friend, now in Paris, reads: "The electric light is as dead here as in England; there is not a single lamp on the Avenue de l'Opera, and I could find but one electric light in all the shops that line the street—this was an arc light. The reason given for this disappearance is the unreliability and expensiveness of the method of illumination. Gas is used unsparingly on the streets and in the shops, and the streets are more brilliant (if possible) by night than by day."

The real truth of the matter is that the electric light has proved an active and serviceable friend to the gas maker, inasmuch as it has gone far towards awakening within him a desire to put forward his efforts in the right direction; it has shown to him that progress must be made in his business if he would reap the fullest measure of success. The public, stimulated to a desire for greater light, from partial familiarity with the "arc" light, but not willing to pay what it considers a prohibitory figure for such illumination, turns to the gas maker and demands from him a better light service than that formerly supplied. The best energies of the gas maker have been devoted during the past year to the solution of this problem, and with what measure of success they have been attended is best answered by referring to the general prosperity of the gas interest throughout the country during the year 1883.

The most interesting, and not the least remarkable, feature of the year's business has been the fact that this greatly-increased volume of gas consumption over that of the preceding year has been accomplished with selling prices greatly below those which ruled at the latter period. It took some time, and much argument, to convince the timorous and faint-hearted that low prices meant increased trade and enhanced profit, not to mention anything in relation to fortifying the gas maker's position against attacks of all sorts. The one great thing to be borne in mind, by the gas industry of this country, is the plain and unmistakable truth that more is to be feared, in the

way of competition in the supply of artificial illumination, from kerosene oil than from all the electric lighting schemes that have been, or ever will be, devised. It is plain to everyone engaged in our industry that here is where the danger lies, and that this is the foe which must be conquered.

How shall the enemy be dislodged? Just by the repetition of such attacks as have been made all along the line during last year. Keep up the work of reducing selling prices; add to the effectiveness of your plant by the introduction of known and tried improvements, and be satisfied with just and equitable profit. Neglect no means, however trivial and small they may at first seem, to improve your apparatus and increase the efficiency of your works. Take, for instance, the excellent examples of methodical and persevering efforts afforded by the experiments of Messrs. Stedman and Slater, the results of which were recounted by them at the New York meeting of the American Gas Light Association. Even the smallest gas works in the country may now take advantage of the benefits afforded by improved methods of carbonization. Coke saved in the heating of your benches means that your residual account is to be increased by so much in dollars and cents. Do not say "What are we going to gain by an addition to our coke piles? We cannot dispose of what we make at present." This statement should never be made. You will not dispose of your coke by simply piling it up in the yard. Get at work and *make* a market for it; teach the people of your city or town how to burn this residual as a fuel; tell them its worth; they will not be slow to appreciate the value of the lesson. This style of proceeding will soon dissipate the coke piles, and make the "dissipation" permanent.

This matter of residuals in gas making is becoming more and more important every year. It is not so long ago that some of the bye-products, which are now so valuable, were not only considered worthless, but were looked upon by the gas maker as decided nuisances; but the advance of knowledge and the application of proper methods have altered all this. The erstwhile nuisances have been converted into blessings; or, if the word "blessings" does not quite express the idea, the dollars and cents received in exchange will make everything plain. While great progress has been made in this direction, still greater results are quite possible of attainment, and, in fact, are certain to be achieved.

Bear in mind that the one great desideratum is to manufacture your product at as low a figure as possible, in order that when the product reaches the consumer's burner it may cost him the minimum price. Maximum sales at minimum selling rates should be the watchwords. Keep these in view, and the history of 1884 will be certain to show even greater advancement than that recorded for 1883.

PERSONAL.—JOS. R. THOMAS.

Since assuming the editorial control of the JOURNAL, Mr. Joseph R. Thomas, C.E., has severed his connection with the Williamsburgh Gas Light Company, of Brooklyn, N. Y. Mr. Thomas erected new works for the Williamsburgh Company in 1861, dating his first services at that point from 1854, and up to the time of his accession to the editorial management of this paper remained in charge of the company as its engineer, a position which he filled with profit to its management and credit to himself. Mr. Thomas now offers his services to the gas profession of the country as consulting engineer. He may be addressed on any matters relating to the construction, alteration, and improvement of gas works, details of manufacture, distribution, etc. All communications should be addressed to the office of this JOURNAL, or to No. 1 Bedford avenue, Brooklyn (E. D.), N. Y.

TO OUR PATRONS.

We herewith desire to extend our sincere thanks to the many gentlemen who favored us with "items of news" from all sections of the country during the past year. We have endeavored to give, through our "Item" columns, in as short and concise form as possible, an account of what was transpiring in the gas business in America, and leave it to the judgment of our readers as to how well we have succeeded in this respect. We would ask the support of our friends in assisting us to keep up the record. Transmit to us any item that may be noticed in order that all may be posted as to what is going on. All that we ask of you is to be satisfied yourselves as to the authenticity and correctness of the information sent. We again thank our correspondents for what they have done, and solicit a continuance of their favors.

Annual Meeting of the Society of Gas Lighting.

The Eighth Annual Meeting of the Society of Gas Lighting was held in New York city on the 20th day of December, 1883. After the transaction of routine business, including the reading of the reports of Secretary and Treasurer, which were referred to the Finance Committee for audit, the Society elected the following-named gentlemen to serve as a board of officers for 1884:

President.—Joseph R. Thomas.
Vice-President.—C. V. Smith.
Treasurer.—James H. Armington.
Secretary.—Fred. S. Benson.
Member of Executive Committee.—Eugene Vanderpool.

Mr. F. C. Sherman, of New Haven, Conn., presented and read a paper on "Different Styles of Bench Work," which was illustrated by an accompanying display of models and drawings. This paper will be reproduced in the JOURNAL.

In the allotment of papers to be prepared and read at the monthly meetings of 1884, the following names were drawn:

January.—William Mooney and Fred. A. Sabbaton.
February.—C. V. Smith and Samuel G. Stiness.
March.—Dudley D. Flemming and Fred. S. Benson.
April.—James H. Armington and F. C. Sherman.
May.—William Farmer and J. L. Hallett.
June.—O. E. Cushing and Wm. Coombs.
July.—Chas. H. Nettleton and Chas. D. Lamson.
August.—C. J. R. Humphreys and George D. Cabot.
September.—A. M. Smith and M. S. Greenough.
October.—Theobald Forstall and Eugene Vanderpool.
November.—A. B. Slater and Thos. Turner.
December.—Jos. R. Thomas and Wm. A. Stedman.

A Mysterious Disappearance.

When the Mutual Gas Light Company of Brooklyn, N. Y., sought to obtain the privilege of operating a gas works in that city in 1877, the incorporators agreed to file a bond in the sum of $50,000, which bond was to be forfeited to the city in case certain provisions of the company's charter, in relation to price, quality of gas, etc., failed at any time to be complied with. At a meeting of the Brooklyn Board of Aldermen, Mr. Houghton presented a resolution calling upon the proper officials to inquire into the subject as to whether the Fulton Municipal Gas Company (which latter company had assumed the charter and business of the Mutual Company) had lived up to the spirit of its obligations. The officials reported to the Board, in answer to Ald. Houghton's inquiry, that the bond could not be found in any of the departments, and could give no satisfactory explanation as to its disappearance.

Ald. Houghton then moved the adoption of the following:

"*Resolved*, That the Mayor be directed to have a new bond executed and entered into between the city of Brooklyn and the Fulton Municipal Gas Light Company (assignees of the Mutual Gas Light Company), imposing the same conditions and restrictions as were contained in the original bond, and for the same amount, and that resident sureties satisfactory to the Mayor (owning real estate in Brooklyn) be procured, and the same to placed on file with the City Clerk.

"*Resolved*, That the Commissioner of the Department of City Works is hereby directed to issue no further permits to the Fulton Municipal Gas Company until such bond has been properly executed and satisfactory evidence given that the company had complied with the requirements of the original bond in the past."

In the discussion that followed the reading of the resolutions, Alderman Hall moved to refer the same to the law committee. He suggested that a record of documents of this character should be kept in the City Clerk's office, and be open to public inspection. Alderman Ruggles intimated that there had been something queer in connection with the disappearance of the bond, and did not see how the law committee could ascertain anything further than was already known. He said the proper thing to do was to require the gas company to file a new bond. Alderman Menninger thought the matter admitted of easy adjustment, stating that what was necessary was the filing of the duplicate of a bond or surety which had been mislaid.

The motion to refer was voted down, and the resolutions were adopted. Secretary Rossiter, of the Fulton Municipal Company, on being spoken to in reference to the subject, replied that he knew nothing about the bond. He said that his company was perfectly willing to file a new one. He further thought that "Alderman Houghton was only trying to make capital for himself."

It might, however, be very convenient to have "that bond" out of the way. Its absence, certainly, would not prove very injurious to the Fulton Municipal Company.

THE resolution presented to the board of aldermen, New York city, requiring all electric light wires to be carried underground, mention of which was made in our last issue, was amended so as to go into effect May first, 1886.

[A Paper read before the Society of Gas Lighting.]

Retort Benches.

By Mr. A. B. Slater.

Of the various kinds of apparatus used in the manufacture of gas and the different processes through which it passes, from the distillation of the coal to the delivery of the gas to the consumer, there is probably no one thing of more importance, and which demands greater attention from the engineer, than the design and construction of the retort bench work; for in this department of the works the success and prosperity of a gas company largely depend. The lamented Dresser very tersely stated this fact when he said, "The money of a gas company is made, or lost, in the retort house."

The condensing, washing, and purifying of the gas may be, and probably is, in most works, satisfactorily accomplished; but there is a very wide difference in the results obtained in the distillation of the coal, and in the cost per ton of the coal distilled. This fact becomes more apparent when we consider that, in some works, a bench of six retorts will distil, in four hours, 1,000 to 1,200 pounds of coal per charge, or 6,000 to 7,200 pounds in 24 hours; while in other works 1,500 to 1,800 pounds are distilled every three hours, or 12,000 to 14,400 pounds every 24 hours. Of course the size of the retorts often accounts for a portion of this difference; but there is a wide difference in the quantity of coal distilled in the same size of retorts in different works.

Again, the quantity of fuel consumed in the furnaces differs materially. In making comparisons of the number of pounds of coke used to distil each 100 pounds of coal, in some cases it would almost seem that these bear an inverse ratio to the quantity of coal carbonized.

This state of things is of such consequence that an investigation into the causes or reasons for it, if ascertained, would prove to be of benefit, at least to some of us. To go into an exhaustive examination of this subject, in all its bearings, would involve more time than we now have at our disposal, and also extend the limits of this paper beyond what I intended; but, in taking a hasty glance at some of the causes which may be assigned as reasons for such difference in results, the following may be mentioned, viz.: The design of the work and the style of setting used; the quality of the stock used in construction; the manner in which it is put together, or the quality of the work; the kind and condition of the fuel used, and the intensity of combustion maintained; the judgment of the fireman, and the attention which he gives to the fires; the ability to maintain a uniform degree of heat; the judgment used in charging, or the regulation of the quantity of coal to the heat maintained in the retorts; the length of time occupied in drawing and charging; the length of time the charges remain in the retorts; the kind and quality of coal used; the judgment used in heating the benches when they are first started; the depth of seal in the dips; allowing thick tar to accumulate at the dips and in the hydraulic main, etc.

The general design of the bench and setting may be good, but if the work is poorly constructed, or the stock used of an inferior quality, it will fail to produce satisfactory results. If the draught is insufficient, by reason of having too short chimneys or other causes; if the fuel is wet or damp, no matter what the quality of stock or workmanship, good results cannot be expected. If the setting, quality of stock used, and workmanship are of the best, if the fireman neglects his duties, either from ignorance or carelessness, the retorts will fail to do their proper work, and damage to the work will follow. If the flues are ample and the draught free, high heats maintained, and small charges, in proportion to the size of the retorts and the heats, are used, the work accomplished will not be what it should be, and the retorts will fail to last as they would if the heats were better utilized by heavier charges.

In the ordinary furnaces there is often great waste of fuel, and consequently loss of duty from the retorts, by badly-fitting door frames and doors, more especially in furnaces that have been used several months, when the joints between the bricks or blocks, which are often made too thick, crumble away, and the frames and doors warp, allowing air to enter around them above the grate bars, causing the fuel to be consumed rapidly at the front of the furnace.

In such cases an insufficient quantity of air enters at the bottom of the furnace, especially from the middle to the back end, resulting in a mass of dead fuel at the back end of the furnace. When the bearer bars are set level with each other, this condition of the fuel at the back end of the furnace remains undisturbed, as the fireman, in shaking the grate bars at the front end, moves them but little or none at the back end, and it continues undisturbed until the grate bars are drawn to clinker the fires. By a very simple arrangement, devised by Mr. Darius Davison, the ashes in the furnace are effectually removed from its whole length, and the fire is kept in better condition for the whole length of the furnace, particularly if the frames and doors are properly fitted and kept tight.

This device consists in setting the middle bearer bar a little higher than the end ones, and making it slotted or notched, so as to keep the grate bars in proper position; and thus, by being higher than the end ones, the grate bars cannot be moved at the front end without a corresponding movement at the back end, so that, when the grate bars are moved at all, the ashes drop from the whole length of the furnace. The fuel is thus better utilized, better combustion secured, and proportionately better results follow.

Everyone knows that the retorts should be drawn and charged in the quickest possible time; and yet much carelessness in this respect is seen in many retort houses. The question of running charges three, four, five, or six hours is perhaps not so much a question of time *per se*, as it is the ability to maintain a heat sufficient to properly carbonize a given quantity of coal in a certain length of time. With a given amount of heat sufficient to work off a medium charge in four hours, in my opinion it is better to work a smaller charge once in three hours than to charge heavier once in five hours, for the reason that, in using a heavier charge and running it five hours, the heat would not be sufficient to convert some of the vapors distilled off during the first portion of the time; whereas, if a smaller charge is used, the heat would be sufficient to convert, proportionately, more of the vapors distilled off during the first portion of the time, and, less heat being absorbed, the retort would not need to remain another hour to recover itself for the next charge.

When the quality of the stock used and the style of the setting are good, they are often ruined, when the bench is first started, by heating it too rapidly—if it be "green," or just constructed.

It is not uncommon to hear superintendents say that 24 to 48 hours is enough time to start a bench and get it at work. It is quite true that, in a stack that has been used before, and in starting up benches next or adjoining those already under fire, less damage would result in firing up too rapidly, but in a new stack too much caution cannot be used in firing the first time. Ten days to two weeks is none too much time (and especially with slow fire for the first week) to properly dry it out and get it at work.

When a bench is heated too quickly, the water or moisture is rapidly driven off, more or less converted into steam, which must escape somewhere; and, in its efforts to escape, broken buckstays, tie-rods, and damaged brickwork are the sure result.

In running high heats much trouble is generally experienced from stopped standpipes and thick tar collecting in the hydraulic main; but, without doubt, much of this trouble comes from inattention to the pipes, and the allowing of tar to accumulate and harden in the hydraulic main. At times, especially in small works, in consequence of cloudy weather, or the consumption of an unusually large quantity of gas by some large consumers, when the supply of gas becomes short, and the engineer is desirous, and even compelled, to make all the gas he possibly can to keep up the supply and runs the heats as high as he thinks prudent, it is advisable to take out the plugs and clean out the dips before they stop up entirely, as much trouble and annoyance will thus be saved.

Many engineers prefer to content themselves with smaller production per retort, and less yield from the coal, because less care and attention are necessary, and trouble from stopped standpipes and pitch in the hydraulic main is materially lessened, or perhaps entirely overcome.

Is has generally been supposed that large yields are accompanied by low candle power; but this does not always follow, for five feet of 17-candle gas is sometimes made from Westmoreland or Penn coal, without enricher; and, again, 4½ feet per pound of coal will require 5 to 10 per cent. of cannel to make the same quality of gas. In one case 30 per cent. of American cannel was used in conjunction with ordinary caking coal, and the gas delivered to the consumers was less than 17-candle power.

These results are convincing evidence that the best conditions for the distillation of the different kinds of coal are not thoroughly understood by all, and experiments and investigation are needed to develop more definite knowledge in this department of our business.

Since the advent of generator or regenerator furnaces, economy has been secured in the saving of fuel, a considerable increase in the production from a given plant, and, in some cases, an increased candle power of the gas has been maintained without enricher of any kind. Another advantage is gained by being able to maintain a much more uniform degree of heat in the benches, and thus secure a more perfect conversion of the vapors distilled from the coal.

This saving is partially accounted for by substituting hot for cold or damp coke, and dispensing with the usual manner of clinkering necessary with the ordinary furnaces. The firing with hot coke is stoutly condemned by some engineers as being unscientific in theory; but, in practice, it certainly proves to be economical.

The cost of construction is increased where the new furnaces are used, but not in proportion to the benefits derived. At one of the works with which I am connected we have just completed a new stack of ten benches—or five double benches—of sixes, with the Dieterich furnaces, 7′ 2″ arches, 8′ 4″ centers, with Davison's retorts, which take a mouthpiece 12′ by 24″, but have 4 feet of the back end 30 inches wide; each retort having three ribs,

each 9 inches wide, one 4 inches from the back end, one 34 inches from the front end, and one between the two. These ribs serve to strengthen the retorts, and also serve a useful purpose in the setting of the retorts, enabling us to dispense with a large portion of the tiles, etc., which are necessary in setting ordinary retorts.

These retorts have a floor surface of about 2,736 square inches, as compared with the ordinary 14" × 26" retort, which has, by actual measurement, about 2,600 square inches of floor surface.

A stack of 10 benches had previously occupied the same place, and the foundation was built upon piles, which were cut off 10 inches above mean low water mark. Upon these piles were placed, side by side, two 12" × 12" sticks of timber, and the piers were started on the timbers. In the center, running lengthwise under the timbers, a sluice-way, about 18" square, was built of planks, and the ends of the lower arches, on both sides of the stack, were planked up, and, as settlement had taken place, it was deemed unwise to construct the new stack on this foundation; and the whole was removed to the piles, an entire new stack being built, with centers of the same dimensions as the previous one.

The piles were poorly driven, about two feet centers and opposite each other. The mud was removed from around the heads of the piles to a depth of about 10 inches, and about 4 feet in width, and the space filled in solid with concrete. On this concrete and pile bed were placed large granite stones, which had previously been used for a retort house floor, and the piers were started on the granite blocks. North River Schultz brick and Norton cement were used in the substructure, and the cost was as follows:

Cost of Foundation and Arches.

168 casks Norton cement, at $1.45	$243.60
35 double loads of gravel, at $1.05	36.75
68 " " sand, at 60 cents	40.80
45 single " " at 30 cents	13.50
81 casks eastern lime, at $1.18	95.58
15 barrels of ground clay, at $2	30.00
27 tons kaolin, at $3	81.00
34,500 No. 1 fire brick, at $30	1,035,00
8,500 No. 2 " " at $25	212.50
7,250 bull heads, at $30	217.50
45,000 old fire brick, at $20	900.00
64 double skew backs, at 98 cents	62.72
32 single " " at 49 cents	15.68
250 thick splits, at $27	6.75
250 thin " at $27	6.75
400 soaps, at $27	10.80
44,500 North River Schultz brick, at $12	534.00
325 square feet granite stones, at 25 cents	81.25
20 lintels 24" × 8" × 4½", at 61 cents	12.20
20 damper tile, 24" × 11" × 2", at 53 cents	10.60
20 slides, single rabbet, at 41 cents	8.20
10 " double " at 41 cents	4.10
10 cast iron lintels, 2,278 pounds, 3 cents	68.34
24 buckstay stones, at $9	216.00
Fire stock for furnaces (10, at $110)	1,100.00
Labor and superintendence	2,736.42
	$7,780.05

Cost of Settings.

60 Davison retorts, at $38	$2,280.00
160 covering tile, 24" × 11" × 2½", at 53 cents	84.80
80 shield " at 58 cents	46.40
30 chock " at 49 cents	14.70
10,000 No. 1 fire brick, at $30	300.00
2,000 No. 2 " " at $25	50,00
2,000 thick splits, at $27	54.00
1,500 thin " at $27	44.50
625 soaps, at $27	16.88
40 clay stoppers, at 15 cents	6.00
10 name plates, at 78 cents	7.80
12 tons kaolin, at $3	36.00
13 barrels ground clay, at $2	26.00
Labor, $481.45; superintendence, $210	691.45
	$3,658.53

Cost of Iron Work.

12 end buckstays, 6,000 pounds, at 3 cents	$180.00
12 slide " 9,200 " "	276.00
1,721 pounds 1¼" tie rods, at 2½ cents	56.65
10 sections hydraulic main take-offs, etc.	961 50
31,300 pounds stand and bridge pipes, at 3 cents	939.00
2 tar gates, connections, etc.	35,00
60 mouthpieces, lids, etc., complete, at $26.50	1,590.00
10 sets furnace iron work	1,320.00
10 ash pans, 2,269 pounds, at 3 cents	68.07
1,521 pounds bearer bars, at 3 cents	45.63
Sundries, including valves, fittings, etc	180.00
Labor	162.00
	$5,813.85

Recapitulation.

		Per Bench.
Foundations and arches	$7,780.05	$778.00
Settings	3,658.53	365,86
Iron work	5,813.85	581.38
	$17,252.43	$1,725.24
Add cost of cellar and iron floor	2,449.82	244.98
	$19,702.25	$1,970.22

[Translated from the *Journal des Usines a Gaz.*]

An Account of the London Gas Companies.

By M. Cornuault.

[The following translation of M. Cornuault's concise and interesting account of the causes which led up to the enactment, by the English Parliament, of the admirable laws governing the gas question in London will no doubt prove of great interest to our readers. This communication appeared in the November number of the *Journal des Usines a Gaz.* In view of the reommendations made by President Hickenlooper, in his annual address to the Pittsburgh (1882) meeting of the American Gas Light Association, and referred to with even greater emphasis by President Forstall, before the same body at the New York (1883) meeting, the reproduction of this article should at once familiarize our American gas makers with the leading features of the legislation which has worked so admirably in the protection of the English gas consumer and gas producer.—Ed.]

In the discussions which have taken place for some time past in different cities, notably in Paris, on the question of the reduction of the price of gas, constant reference has been made to the example of London; and this is done in many instances without a thorough comprehension or study of the subject, the bare fact of the relative cheapness of gas is mentioned without attaching any importance whatever to the different conditions under which the French and the English companies exist.

It seems to us that it will not be altogether void of interest if we devote a short article to the consideration of the actual organization of the London gas companies, and follow them through the different phases of their existence from the time of their first introduction into the city up to the present day. We can derive a great deal of instruction from their history; we can profit by their experience in organizing. Besides, we shall find an easy and complete refutation of the many serious errors that are spread broadcast before the public which may be hurtful to our interest.

The city of London proper, possessing a population of 3,831,719 inhabitants (census of 1881), is really lighted by four distinct gas companies, producing 572 million cubic meters of gas (1881).[1] The four companies in the city are designated as the Metropolitan Gas Companies, in distinction from the Suburban Gas Companies, which light the suburbs.[2]

The metropolitan companies are—

1. The Gas Light and Coke Company.
2. The Commercial Gas Light Company.
3. The South Metropolitan Gas Light and Coke Company.
4. The London Gas Light Company.

These four companies supply one or more clearly defined districts.

This is the actual condition of affairs at present. It has not always been so. From 1810 to 1854 the number of companies steadily increased, so that in the latter year there were no fewer than 13.

The following is the order in which they were chartered by acts of Parliament. We will add, however, that several of these companies had commenced to furnish gas without being regularly authorized to do so.

1. Chartered Gas Light and Coke Company	1810
2. City of London Gas Company	1817
3. Imperial Gas Company	1821
4. Ratcliff Gas Company	1823
5. Phenix Gas Company	1824
6. Independent Gas Company	1829
7. Equitable Gas Company	1831

1. 595 million cubic meters in 1882. A cubic meter = 35 cu. ft., 547 cu. in.
2. The suburban companies number 14, and produced, in 1881, 82 million cubic meters of gas.

8. South Metropolitan Gas Company (organized by private act since 1833) 1842
9. London Gas Company..... 1844
10. Commercial Gas Company..... 1847
11. Great Central Gas Company 1848
12. Western Gas Company (organized in 1850 by private act) 1850
13. Surrey Consumers Gas Company (established in 1850 by private act) 1854

From 1854 to 1870 the number of companies remained fixed at thirteen. Since 1870 the number of companies has steadily decreased. In 1872 there were only 9; in 1876, 6; in 1880, 4; because the South Metropolitan absorbed, in 1879-80, the Surrey Consumers Gas Company and the Phenix Company.

The Chartered Company absorbed the City of London Company in 1870; the Great Central Company in 1870; the Equitable Company in 1871; the Western Company in 1872; the Independent Company in 1876; and the Imperial Company in 1876.

The Commercial absorbed the Ratcliff Company in 1875.

The South Metropolitan Company absorbed the Surrey Consumers Company in 1879, and the Phenix Company in 1880.

To this we will add the fusion of the London Company with the Gas Light and Coke Company,[1] which has been the occasion of many and lengthy negotiations, but has at last been accomplished, thus reducing to three the number of companies lighting London.

It would not be unreasonable, in view of the preceding facts, to predict that only two companies—one north and the other south of the Thames—will divide between them the lighting of the city; perhaps only one will have that great privilege. Whatever may be the outcome of it, the tendency is daily more and more toward the French system of consolidation.

Since 1855 the six companies lighting Paris have been consolidated in one. To this the London companies are coming, after having discovered, by experience, the difficulties and drawbacks attendant upon the management of small gas companies.

In 1810, after having debated the subject for two years, and in the face of a strong opposition, an act of Parliament was passed authorizing, under certain conditions, the formation of a company to light a small portion of the metropolis for three years. The Chartered Gas Light and Coke Company (the first metropolitan company) was thus established.

A small works were erected in Peter street, Westminster. December 31, 1813, the company lighted Westminster Bridge;[2] some months after several streets of a neighboring parish were lighted with the gas. Thus the future of the industry began to take shape. Such was the prejudice, however, that in order to induce people to try it, and to secure the introduction of gas in the shops, the company itself was obliged to bear all the expense of connecting with the mains and piping the houses, and, besides, furnish the gas free; in addition to this it had to contend with all the difficulties of manufacture, and, above all, the distribution.

For about two years the consumption of gas was at a standstill. We must also bear in mind that a new industry had to face difficulties in those days entirely different from that which any new enterprise, of no matter what kind, would have to meet to-day, and that obstacles and prejudices then yielded only to time. As very justly remarked by M. Schilling, in a recent work, translated and annotated by M. Colladon,[3] times are now very different; the electric light, for example, has received at once the aid of science and capital, and every means which can serve to advance it.

The Chartered Company had faith in its work, and with unremitting perseverance overcame the chief difficulties. Other companies were not slow to follow its example. First the City of London Company was organized, in 1817; it ought to have been the only one lighting the city, as its name seems to indicate. The Imperial Company, which lighted the north side and the suburbs, was established in 1821; then followed, in regular order, the various companies as given in the above list.

Starting out, the companies were not confined to any limited extent of territory; they were under no restriction as to the price they were to charge, nor to the amount of dividends they could declare on the capital invested. For a long time the price of gas was maintained at 15 shillings per 1,000 cubic feet; then it fell to 12s. 6d.; afterward to 12s.; then to 11s.; and to 9s. in 1834, according to the circumstances of the different companies. In 1850 the Commercial Company and the Surrey Consumers Company could only obtain 4s. 6d. for their gas. It is true that the price of gas was subsequently raised in the city.

The companies furnished whatever quality of gas they liked. They were not obliged to furnish any at all unless it suited their convenience.

1. The fusion was authorized May 22, but was to go into effect July 1, 1883.
2. M. Chubb's note to the Statistical Society.
3. "Lighting by Electricity and Lighting by Gas."

Parliament seemed to have great trouble in arriving at a decision as to whether the various companies should each be confined to lighting a certain district; the manner of lighting the city added still more to their perplexities. In 1822 a commission was appointed to study the whole subject. The commission reported that each company ought to light a certain given district of the metropolis.

The wisdom of this measure has since been abundantly proved. At the time, no heed was paid to the report of the commission, so that companies chartered for certain districts were not given the exclusive right to their territory. In a little while Parliament encouraged still greater competition by giving its approval to the formation of new companies, although the old ones then declared but very small dividends. Nevertheless, capitalists and speculators were found ready to take hold of new enterprises for lighting sections of the city already lighted by the old companies under Parliamentary authority.

The Independent Company was established, in 1829, to compete with the Imperial Company; they soon afterwards mutually agreed to divide their territory.

The Equitable Company, in 1831, entered the field of the Chartered Company; the London Company, in 1844, opposed the Imperial Company; in 1848, the Equitable, the Chartered, the Phenix, the South Metropolitan, and the Great Central Companies were chartered to compete with the two companies that then lighted the city.

The Surrey Consumers Company, in 1850, was organized to compete with all the companies on the south of the Thames. The Western Company was also permitted, in 1850, to compete with the Chartered, the London, and the Imperial Companies.

The greater number of the competing companies were established or pushed along by consumers' syndicates coming to some understanding or arrangement with the local authorities by which gas for lighting the public buildings was furnished at a very low rate.

Under this system, which prevailed from 1830 to 1857, certain streets were occupied by several mains, belonging to as many as four different companies; each company was, of necessity, compelled to open trenches frequently in the streets to make connections or to repair the mains. It was often impossible to tell the pipes of one company from the other; it frequently happened that one company supplied gas to its clients out of the mains of one of its rivals. In addition to this, it was impossible to locate a leak; when one did occur all the companies were obliged, in turn, to open the trench. In this way the street was constantly upturned; in this way the companies wasted an enormous capital by laying several mains where one only was needed. The public suffered great inconvenience from the confusion infallibly brought about by such a lack of system.

The result of the competition, far from lowering the price of gas, conduced, on the whole, only to augment the cost of manufacture; for, unluckily, an agreement was entered into between the competing companies to establish a uniform price, and to pay the highest interest they could on their capital, an important part of which was uselessly spent in the several mains. A general act of Parliament (Gas Works Clauses Act, 1847) had, it is true, limited the dividends of the companies to 10 per cent.; but, by reason of the very conditions under which they existed, this rate was attained in two or three instances only.

It is a decided mistake to imagine that competition in this special instance produces cheapness; as long as understanding or agreement between several companies, whose number is necessarily limited, is possible, their competition is impossible. It is, therefore, evident, *a priori*, that companies or individuals will not long engage in a contest injurious to their interests to inure only to the greater benefit of the public; we know of no means to compel them to do it.

The companies were themselves compelled, in 1853, to adopt the system recommended in 1822 by the special commission. London was divided into distinct districts, each district being lighted by a single company. The companies soon reaped the benefit of this system, and the interests of the consumer were in nowise injured.

In 1853 the four companies south of the Thames came to an understanding and divided the territory between them; in 1857 the companies north of the Thames followed their example.

The same experience, in Paris, led to similar results. In 1839, by order of the municipal authorities, Paris was divided into six separate districts, thus giving a district to each of the six companies then organized.[1]

The public, however, in England and in France, as well as elsewhere, have a horror of the word monopoly; and in 1857, when the consumers saw the north companies dividing that part of London into districts, they protested

1. The Marguerritte Company, created in 1821; the French Company, in 1820; Paris Company, in 1836; Belleville Company, in 1834; La Carriere Company, in 1834; and the Western Company, in 1839. In 1855 the Paris Company, absorbed the five other companies.

energetically, fearing that they were about to be delivered over to the mercy of a single company who could, at that time, raise the price of gas as high as it liked, owing to the laws then in force. An agitation ensued; Parliament considered the question at great length in 1858, 1859, and 1860. On August 28, 1860, the Metropolis Gas Act clearly recognized the wisdom of the course pursued by the companies, and the absolute necessity of having only one company in each district of the metropolis. But, at the same time, the act placed the companies under heavy penalties and restrictions, with reference to the price, the illuminating power, the purity of the gas, etc., and also fixed a maximum rate of dividend; all these restrictions were imposed as a condition consequent upon the possession of the monopoly.

The principal obligations imposed upon the companies by the act of 1860 were, in a few words, as follows: The companies were obliged, under well-defined penalties, to furnish a sufficient quantity of gas, at all times, to every person demanding it in the district, coupled with the condition, however, that the consumer give sufficient guarantee of payment; they must extend mains in all directions wherever demanded, whether it be for public or private use, with certain restrictions, however, when the distance to existing mains did not exceed a certain limit.

The maximum price of gas was fixed at 4s. 6d. per 1,000 cubic feet. In certain exceptional cases the Secretary of State of the Department of the Interior was authorized to permit an increase of the price, which in any case could not exceed 5s. 6d. per 1,000 feet.

The illuminating power of the common gas, tested at a point about 1,000 yards distant from the works, was required to be of such a quality that an Argand burner of fifteen holes, consuming 5 cubic feet per hour, should yield a certain light equal to at least twelve spermaceti candles, six to the pound, and burning 120 grains per hour.

For cannel coal gas, a Manchester burner, consuming 5 feet per hour, should yield a light equal to 20 candles.

As regards purity, it was required that the gas should be sufficiently cleansed from ammonia and sulphuretted hydrogen, so as not to affect litmus paper, nor sugar of lead paper, when exposed for one minute to a current of gas under the pressure of 5-10ths of an inch of water. The gas, under any conditions whatever, must not contain more than 20 grains of sulphur per 100 cubic feet. The companies were to be subjected to heavy penalties if the gas were not of the quality or purity established by the act. They were obliged to furnish meters at prices determined by the location.

They were obliged annually to render a report of their doings, together with all the details which the Secretary of State of the Interior might demand, in order to show clearly what their profits were.

Dividends were limited to 10 per cent. per year; all surplus in excess of this amount, besides the amount necessary to form a fixed reserve fund, designed to maintain this rate of dividend, must be applied to the reduction of the price of gas.

Such were the advantages given the public by the Metropolis Gas Act of 1860, and also the very heavy burdens placed upon the companies by Parliament for acquiescing in the system of division that had been adopted by the companies themselves.

The great increase in consumption, and the obligation resting upon the companies to supply gas to every one, and in any quantity, compelled them to increase their capital from year to year, in enlarging their works and developing their system of mains, in order to be able to fill all their obligations.

Notwithstanding all this, their condition was soon so much improved by the system of distinct districts, that they were all able to distribute 10 per cent. to their stockholders, and sometimes even exceed this sum to make amends for past deficits.

But the local authorities, the Corporation of London in the city, and the Metropolitan Board of Works outside the city, did not cease their opposition to the companies, in order that still more favorable conditions for the public might be obtained.

The agitation went on increasing up to 1866, when the local authorities complained to Parliament that the act of 1860 was far more favorable to the companies than had been anticipated. Parliament appointed a special commission to study the question; this commission, yielding to the wishes of the complainants, recommended Parliament to authorize the manufacture of gas by the local authorities in competition with the gas companies, at least until such time as the companies would accept new conditions, which new rules may be summarized as follows:

The maximum price to be fixed at 3s. 9d. per 1,000 cubic feet, with a 16 candle illuminating power.

At this price it was argued the companies could pay 10 per cent. interest on their capital; if they could not, then an investigation could be made at the request of the company, by a commission appointed *ad hoc* by the government; this commission had the power to raise the price of gas, for a year, up to the maximum of 5s. 6d., for the purpose of giving the company an opportunity of paying a dividend as near 10 per cent. as possible.

On the other hand, the local authorities could demand an investigation for the purpose of obtaining a reduction in the price of 3s. 9d. per 1,000 cubic feet, if they had reason to think that a lower price than 3s. 9d. would yield sufficient to declare a dividend of 10 per cent.

All the companies, at first, refused to accept these conditions; but the Corporation of London continued its resistance; a bill was drafted, in 1868, authorizing the construction of municipal gas works, which would furnish gas in competition with the existing gas companies. The three city companies yielded, and new conditions were inserted in a new act of 1868 entitled, "The City of London Gas Act, 1868."

This act marks a second stage in the organization of gas companies. The Imperial Company, in 1869, accepted an analogous régime. The gas companies supplying districts outside of the city were not submitted to these conditions, and remained under the jurisdiction of the act of 1860. In 1872 and 1873, when the coal crisis occurred, and when the price of coal was tripled and quadrupled in certain instances, these companies raised the price of gas themselves, as they had a perfect right to do; the two largest companies, the Chartered and the Imperial, were obliged to demand an investigation for a revision of the act of 1868. The result of the investigation was entirely favorable to the two companies, which were authorized, despite the protest of the local authorities, to raise the price of gas, as a measure of necessity, to enable them to declare the dividend of 10 per cent. in the years of the crisis; this increase in price was no longer necessary after 1874, and the maximum price of 3s. 9d. was resumed January 1, 1875.

The Corporation of London and the Metropolitan Board of Works continued their warfare on the companies, and, in the session of Parliament, 1874-1875, several bills were presented for the purpose of still further revising the last act of 1868. After a long and close study of the question the commission that had been appointed came to this conclusion: Commencing with an initial price of 3s. 9d. for 16-candle gas, the companies could increase their dividends beyond 10 per cent., provided they reduced the price of gas in the same ratio; and, inversely, they could raise the price of gas above 3s. 9d. whenever they were unable to declare a dividend of 10 per cent.

This was what they call the sliding scale system, to which the different companies then existing submitted in 1875 and 1876,[1] reserving to themselves certain rights, however; for instance, the right to amalgamate, to increase their capital, etc. The only company that did not come under the control of these acts was the London Company, which then remained (and is still) under the jurisdiction of the act of 1860.

According to the sliding scale system, the companies are tied down to a fixed maximum price, which, for the three companies outside the London Company, is as follows: For the Gas Light and Coke Company and the Commercial Company, 3s. 9d.; and for the South Metropolitan Company, 3s. 6d.

To declare dividends above 10 per cent., the companies must reduce their maximum price. For each penny reduction on this price a corresponding increase of 1s. 4d., per £100, dividend is allowed.

Thus, for example, the South Metropolitan, whose maximum price is 3s. 6d., and which sells to its consumers at 2s. 10d., has, by reason of this reduction of 8d. on the maximum price, a right to declare eight-quarters dividend, or 2 per cent. above 10 per cent.—a dividend of 12 per cent. To declare a dividend of 14½ per cent., it must sell gas at 2s.

The Commercial Company, whose initial price is 3s. 9d., and whose selling price is 2s. 10d., can declare a dividend of 12¾ per cent. It will probably do that this year.

If the profits exceed the limited amount, the surplus can be deposited with a trust company, to guard against accident. This amount can never exceed 5 per cent. of the capital invested; should it ever exceed this rate, the excess must be placed to the credit of a special account, and added to the profit of the next year.

This ingenious system aims at securing the interests of both the consumer and the manufacturer, by making their interests identical. The Paris Company,[2] evidently receiving its inspiration from this source, has made a proposition to the city of Paris, in consideration for an extension of their monopoly, to apply one-half the net profits of each year's manufacture, over and above a certain fixed sum, to a regular reduction of the price of gas.

The objection to this system is that it submits the companies to a sort of tutelage; it could, at times, operate in such a manner as to restrain enterprise, especially in the direction of such an increase of capital as would be essential for a proper development of the works, if the authorities charged with the control of the finances of London were not wise enough to exercise their functions with proper moderation.

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1. The Commercial Gas Company Act, August 11, 1875; the Gas Light and Coke Company Act, August 11, 1876; the South Metropolitan Gas Company Act, August 11, 1876.

2. Proposition accepted by the Prefect of the Seine in 1882, and rejected by the Municipal Council.

The acts of 1875 and 1876 mark the third stage in the organization of gas companies, and seem to have definitely settled the system adopted in London. A series of clauses in these acts defines minutely the conditions under which an increase of capital will be permitted, the manner of using the reserve, etc.

The entire financial control is placed in the hands of an auditor of accounts, who must be a competent and independent person appointed by the Board of Trade. He is the possessor of very considerable powers. Whatever papers or documents he wishes must be furnished him; twice a year he has the right to prescribe the manner in which the accounts must be kept; no dividend can be declared until the accounts have been approved by him.

Testing the quality of the gas belongs to the Gas Referees, a sort of supervising commission also appointed by the Board of Trade, and consists of three competent and impartial persons, one of whom must have a practical knowledge of and experience in the manufacture of gas; they direct the measures to be taken for testing the quality, the degree of purity of the gas, etc.

The ordinary gas furnished must have an illuminating power such that a burner consuming 5 cubic feet per hour will yield a light equivalent to that furnished by 16 sperm candles,[1] six to the pound, and burning 120 grains per hour. These conditions are somewhat different from those prescribed by the act of 1860; the chief difference consists in the illuminating power, designated in the number of candles, which is increased from 12 to 16, or 33 per cent. In reality, the increase in the illuminating power required is far greater than 33 per cent., because the standard burner used in 1860 was inferior to that adopted in 1868, which, with the same gas and the same hourly consumption, gives a superior light—the difference equalling 2 candles.

The standard burner used in the photometric tests is Sugg's London Argand, which was the burner used by the Gas Referees under the act of 1868, and has since been officially adopted at the conclusion of a report from the Gas Referees in July, 1871.

It will be of interest to note what the illuminating power of London gas is as compared with that of Paris, which is used as the standard for France.

In London, with a consumption of 141.5 liters (5 cubic feet) in the standard burner—Sugg's London Argand—a 16-candle light must be produced.

In Paris, with a consumption of 105 liters in the standard burner (Bengel), designated by direction of Messrs. Dumas and Regnault, the intensity of a regulating carcel must be obtained, or a light equal to 9.6 candles.

If the London and Paris burners were identical, or, at least, if they used gas under the same conditions, we would come to the conclusion, as the result of a single ratio, that 105 liters of London gas would produce a light equal to $16 \times \frac{105}{141.5}$, or 11.8 candles, and that the same consumption of gas in Paris, giving only 1 carcel or 9.6 candles, the ratio of the standards would be $\frac{9.6}{11.8}$, or 81 per cent. The standard of gas in Paris would therefore be nearly 20 per cent. lower than that of London; in other words, the standard of London gas being 16 candles, that of Paris would be equal to 16 candles × 0.81, or 12.96 candles. Such would be the result if the whole question were to be determined by calculation only.

This method of establishing the inferiority of the one over the other would not be accurate, because the London standard burner uses the gas to better advantage than the Paris standard; the kind of burner has, therefore, an undoubted influence on the result; and not to take this into account would be to commit a very material error—an error of the same kind that we would commit if we were to compare two gases of different illuminating standards; for instance, the Bengel burner with one gas and Ville's butterfly burner with the other. In that case we know that we would have to consume 105 liters of standard Paris gas in the first instance, and 127 liters in the second.

In this connection, then, the only conclusive experiments are those directly and carefully made. Professor Lellanc, tester of gas for the city of Paris, after making several experiments at the Paris municipal laboratory, embodied them in a report to M. Huet, Deputy Commissioner of Public Works, and gave, as the result of his labors, the following comparative statement: 141.5 liters (5 cubic feet) of Paris gas burned in a London standard burner produced a gas equal to 14.7 candles: the inferiority of the Paris gas was thus proved to be only 1-12th, or about 8 per cent.

In experimenting at the same time with the photometer, Bunsen's system, on the same principle as the official photometer of London, on several different occasions the Paris gas was found to be of a standard close to 16 candles.

There is only one other point that remains to be made clear—the value of the English candles in carcels. We have admitted above that the value of the candle was $\frac{1}{9.6}$ carcel, or 0.1050 carcel. This is the value given by Schilling, which is quite close to that of $\frac{1}{9.5}$ carcel, or 0.1052 carcel, as given by Mr. Sugg, of London, and constantly used in England in comparing with French units. This value of the candle can largely be regarded as a fixed standard. As a result of tests made at the Exposition of Electricity in 1881, it was found that the number of sperm candles equivalent to a carcel varied from 8.8 to 9.5 for different samples of the candle type. We learn, also, from a report presented in 1880 to the Board of Trade, by an English commission of whom Professor Williamson was one, that candles taken from two different packages of the same make varied from 14 to 15 per cent. Recent experiments made by M. Monnier, operating upon 36 candles, showed still more remarkable variations. For instance, from 0.130 carcel to 0.102 carcel for the equivalent of a candle—quite a difference. Besides this there has been discovered a variation of 1,587 carcels in the consumption of 5 cubic feet per hour in the London standard burner, which corresponds to 13.2 candles, reckoning the candle equal to 0.12 carcel (the average of 36 experiments made), it will correspond to 14.9 candles, reckoning the candle equal to 0.105 carcel, Sugg's value.

It is difficult, in view of such variations, to speak with certainty on the average of a small number of experiments; we ought to await repeated trials, specially made at London with Paris appliances, and, notably, with the same kind of photometer, before we can say it is a fixed fact. We believe, however, that we are not far from the truth in admitting, provisionally, the approximate value of 14 English candles for the illuminating power of Paris gas as compared with London gas of 16 candles.

The pressure of gas ought to be at least equal to 1 inch of water (25.4 millimeters) from sunset to midnight, and 6-10ths of an inch (15.24 millimeters) from midnight to sunrise.

With reference to its purity, the gas furnished should be entirely free from sulphuretted hydrogen; the tolerance permitted in the act of 1860 is no longer permissible.

Some time during the week succeeding each quarter, the chief inspector sends a report to the Corporation, to the Metropolitan Board, and to the company, setting fourth the illuminating power, the degree of purity, and the pressure, as established by the daily tests.

The before-mentioned acts set forth and establish the penalties incurred by the companies when the gas furnished does not meet the requirements in the illuminating power, as well as in the pressure and purity.

The above is a very rapid sketch of the general system under which three of the four great gas companies of London operate; the fourth Company (the London Company), which is the least important, remains under its old union with the Gas Light and Coke Company, as regulated by the act of 1860.

[To be continued.]

1. From the suburban companies only 14-candle gas is required.

Opinion of Prof. Henry Morton as to the Practicability of Placing Electric Light Conducting Wires Underground.

In a late issue of the New York *Daily Times* there appeared the following communication, from the pen of Professor Henry Morton, in regard to the above-named subject. The Professor says:

In considering what should be done or left undone in reference to the running of wires to supply electric lights in the streets of New York several questions present themselves as requiring answers before a judicious conclusion can be arrived at. What is the present extent of the business involved? What dangers or inconveniences do actually exist, or have been proved to exist, in the present systems during the two or three years of their past use? What remedies have been suggested, and what effect would the application of these remedies have upon the continuance and extension of these uses of electricity? What light does experience in Paris, London and elsewhere throw on this subject? What possible dangers or inconveniences have been suggested as likely to be encountered, though not yet experienced, and what probability is there that these anticipated dangers will ever be realized?

In the first place, let us consider what is the present extent of the use of electricity conducted through the streets of the city of New York. In the first place, we should observe that there are three general systems of distribution now in use:

First—The underground low tension system of Edison, used exclusively for incandescent lamps, each of which gives a light about equal to that of one gas burner.

Second—The medium tension aerial system, used by the United States Illuminating Company for incandescent lamps arranged in series.

Third—The high tension aerial system, used by the United States, the Brush, the Fuller, and other companies for arc lights.

First—The Edison underground system comprises a network of conductors whose united length is about 16 miles, and which are distributed over an area comprised between Beekman and Wall streets and Broadway and the East River. This actually supplies current for about 5,000 incandesent lamps, expressing a total illuminating capacity of about 80,000 candles. The total number of lamps connected is about 10,000, of which the largest number in use at one time has been 5,000.

Second—The medium tension system has as yet reached so small a development that it need not be taken into account in comparison with the others.

Third—The high tension system comprises between 300 and 400 miles of aerial wires, running all over the city, some single circuits being 10 miles in length, and supplies about 1,800 arc lamps of about 500-candle power each, or, in the aggregate, about 900,000-candle power.

It will appear from the above that the third system, as to the length of its conductors (say 350 miles), exceeds both the others about twenty times, and as to the amount of light supplied exceeds them about five times. This being the extent of the various systems, we will next inquire what damage to life or property has actually been occasioned by each and all since their establishment. To any one who has read what has recently appeared in the papers on this subject the correct answer to this question will, I think, be very surprising.

In the first place, the only loss of life certainly due to any of these systems is the killing of one of the employes of the Brush Company while he was engaged in the hazardous operation of splicing a wire in which the most powerful current was running. There is also reported the case of a waiter who fell from the outer railing of the Metropolitan Concert Garden, either in consequence of receiving a shock from an arc lamp or simply by losing his footing. Beyond this there is not a case truly recorded of injury to man or animal by reason of the electric currents in these hundreds of miles of wires.

Two stories have appeared in the papers of horses injured by the currents from wires, but both of these proved on investigation to have been absurdly misstated. Thus, the horse said to have been thrown down on Fifth avenue by the electric shock on stepping on a wire and killed, was, in fact, tripped up by and entangled in the wire, but received no injury whatever, save that inflicted mechanically by the wire, and is at present alive and well. So also the pair of horses reported to have been thrown down by shocks from a telephone wire which had fallen across the Brush wires on Fourteenth street. They were, in fact, simply entangled in a telephone wire, which was not in connection with any other wire and was incapable of giving the slightest shock.

So is it with the stories of firemen injured by electric shocks. I am informed by those on whose statements I can rely that there is no official record of any injury to a fireman caused by the current from an electric-carrying wire.

In the second place, as to damage to property by fire: It is the duty of the Fire Marshall of New York to ascertain and inquire into the origin of all fires within the city limits. The records of this officer show since May, 1881, ten items referring to fires caused by the electric light systems, and the total loss reported from these is $85, of which $75 is due to the Edison underground system, and $10 to the medium tension incandescent system of the United States Company. The first item is dated May 15, 1881, and refers to the burning of an insulation on two arc light wires. No damage. The next two items are of the same character. Then on October 25 comes the burning out of magnets in three fire-alarm boxes and of the relay magnets at Central Office. This result might be caused by atmospheric electricity, and, like that source of danger, can be readily provided against by the use of fusible safety catches. The next item is October 13, 1882. Wood-work ignited by the carelessness of a boy in handling an incandescent lamp of the United States Company. Damage, $10. The next item, December 10, 1882. No. 174 William street. Damage, $50. Edison Company. The next is June 10, 1883. No. 121 Front street. Damage, $20. Edison Company. The next, September 10, 1883. Nos. 165 to 167 Bowery. No damage. New York Electric Light Company. The next, September 23, 1883. No. 88 South street. Damage, $5. Edison Company. Lastly, October 3, 1883. Nos. 165 and 167 Bowery. No damage. Wooden ring on lamp ignited. New York Electric Light Company.

From these records it would appear that as a matter of actual experience the entire damage considered worth reporting was caused by low or medium tension systems supplying incandescent lamps, and that by far the greater part of this was due to the Edison underground conductors. Moreover, it is worthy of notice that the above ten items are the example of the "fires started by the electric wires" given in the *Times* of November 18, on the authority of the Fire Marshal George H. Sheldon.

The insignificant amount of the damage and its distribution among the systems is remarkable. Both are largely explained by the fact that fire caused by such means, especially with the aerial conductors, is sure to be at once noticed and promptly suppressed. Where the conductors enter buildings underground defects in insulation are not so conspicuous, and a fire if started not so quickly discovered. The net result of two and a half years' experience certainly shows that this new agent of illumination is very much safer than any of the old ones it replaces, even under the disadvantages of novelty and first introduction.

Few and slight, however, as the losses and dangers from the introduction of the present systems of electric distribution have been, there is no reason why we should not try to make them less; and with this object we will examine the plans which have been proposed for that purpose. The most prominent of these is the substitution of underground for aerial conductors, and for this its advocates claim by implication an avoidance of existing risks. In considering this question there are certain points deserving attention, which seem so far to have escaped the notice of those who have written on this subject.

First—As far as the use of electricity within buildings is concerned, it manifestly can make no difference whether the conductors are above or underground on their way to the building, except that, as I have indicated before, the underground wires can more easily get out of order and cause fires, or become grounded and thus involve greater risk to those touching them, than can the aerial lines. That this is in fact so is proved by experience of the Fire Department, whose records show that more than seven times as great loss has occurred from the 16 miles of underground wires than from the three hundred-odd miles of aerial wires, though the latter have been much longer in use. Manifestly, then, as far as all interior uses are concerned, the underground system is not to be preferred.

As to the out-door applications, there is little to choose on the score of safety. If carried from place to place underground, the chance of ground connection would be much increased, and as the conductors must come above ground whenever used the risks of injury from accidental contact with them would be augmented, so that this disadvantage would, I think, compensate for the small gain which would result from the diminished amount of circuit exposed. Even, therefore, if we assume that there are no practicable difficulties in the way of carrying these currents underground, the motive is small, or not in favor of the change on the ground of security. As a question of beauty, I readily grant that all overhead wires of every sort should be suppressed; but let us see if we can afford to sacrifice to the graces all that is required in this connection. Experience is better than theory in any case, and we can, I think, refer to experience with advantage in the present instance.

We all remember how, five years ago, Paris was ablaze with electric lights. To day, I am informed by several friends who have just returned, electric lights are hardly to be found in the streets of that city. From the first the conductors were there all run underground, and from the first, as was pointed out at the time, the expense was fatal to any commercial success in such lighting. As long as the city was willing to pay from eleven to thirteen times as much for the electric as for gas lighting it could be done, but when the novelty wore off and matters came to a business basis, the electric lights went out and the gas lamps were relit. Turning, again, to London, where likewise the wires have been put underground, extremely little has been done in the way of street lighting or electric distribution from central stations. Coming nearer home, we find that in Chicago, in St. Louis, and in Milwaukee, where ordinances have been passed requiring conductors to be laid underground, no progress has been made in street illumination by electrict lighting from central stations. Judging, therefore, from experience and observation alone, it would seem that it is impossible to carry on successful electric lighting on an extensive commercial scale with underground conductors.

Were the wires ordered to go underground in New York it is highly probable that our streets would soon return to their pristine gloom, as have those of Paris. To be sure, our enterprising companies might maintain some part of their work by establishing small stations at numberless points, each supplying its immediate neighborhood. But the risk and nuisance involved in this multiplication of small boilers, engines, and machines would far exceed any now existing. To put underground three hundred odd miles of conductors during a year, to say nothing of alterations and repairs, would about extinguish the remaining patience of New York citizens, and render the city quite uninhabitable during the progress of the work. To say that a few wires have been put underground in Paris, London, and elsewhere, and have been operated efficiently, if not with economy, proves nothing whatever as to the possibility of accomplishing even the same thing in New York, where the enormous extension of the system as regards the length of circuits enhances the difficulties of the problem, while the entire absence of available subways or sewers makes an additional difficulty. In other words, what would be possible, to a limited extent, in Paris or London, would be absolutely impossible on the scale of existing systems and with the absence of favorable conditions found in New York.

Moreover, it must not be forgotten that the only real motive for using an underground system is the desire to avoid the ugly looks of aerial wires, and this would be little affected by removing the electric light wires alone, since

they form but a small fraction of the entire system, being outnumbered tenfold by the telegraph and telephone lines. The æsthetic requirements can only be met by the removal of all wires, and this is a problem which seems to defy any suggested solution short of a system of subways, which would be equivalent to adding a duplicate set of thoroughfares to the principal streets underground.

If this were done thoroughly and systematically, then all sorts of electric conductors could be placed in such subways with security and assurance of efficient working, and be accompanied by water, gas, and steam pipes, thereby relieving the streets from the endlesss upheavings now suffered, and which would be multiplied to an intolerable extent if the electric companies were added to the licensed excavators who now hold practical possession of the city's thoroughfares.

Turning next to the suggested danger, of whose actual existence no evidence is even claimed, that which is most talked about is the risk that firemen would run in directing a stream of water against a wire carrying a current. While there is no evidence as to any such result ever having been observed, we have the best evidence against the probability of its occurrence in two instances, which were related to me by eye-witnesses. During the burning of the Park Theatre about a year ago, two firemen held the nozzle of a hose, which for upward of an hour played against and through a Brush lamp, through which there was all the time passing the full current of a 40-light machine. The jet of water smashed the globe, knocked out the carbons, and then deluged the lamp (the current passing through it by its automatic switch) and thus came in full contact with uninsulated parts of the circuit, but not even a shock was perceived by the firemen. Without a doubt, theoretically some infinitesimal part of the current may have passed through them, but an infinitesimal amount of electric current is as harmless and inappreciable as the infinitesimal quantities of poisons which we swallow every day in the purest foods.

In order that an electric discharge should kill, it is not enough that it should have sufficient electro-motive force to overcome the resistance of the human body. It must also possess considerable quantity. Hundreds of people, myself among the number, have taken the discharge of induction coils where the electro-motive force was many hundred times that of a 40-light Brush machine without any ill-effect. Lightning, as its heating effects show, has not only a high electro-motive power, but also a quantity vastly greater than that of any electric arc light current ever met with in ordinary use, and any indefinite or ambiguous statement to the contrary, even by high authority, must simply be regarded as misunderstood or erroneous; and those who have been killed by lightning have certainly not yielded to any insignificant quantity of the electric discharge. Should such a combination of conditions occur as would cause a large part of a powerful electric current to pass into the body of a fireman holding a hose, it would, of course, kill him; but the fulfilling of such conditions is as improbable as would be those which would cause him to be struck by lightning, which also might follow down a stream of water.

In this connection it must not be forgotten that whenever a wire breaks the current in it is by the act annihilated, and this is at once known at the central station by the extinction of the pilot-light, which is the signal for the immediate stoppage of the machine; so that the idea of current in broken wires is purely a figment of the imagination as far as arc light circuits are concerned. In the low-tension underground system, however, conductors are so connected that a single rupture on a distributing branch of a circuit does not destroy or cut off the supply, which is simply diverted into another channel.

If it is considered that the interests of the citizens of New York can be served by the abolition of all electric lights using overhead wires for the sake of the architectural beauties they now deface, such a result is no doubt attainable; but it must not be forgotten that this means the loss of almost all public light, as these, whether on lamp-posts or in or opposite store windows, are as a rule supplied from central stations, and also that this remedy leaves the æsthetic problem where it now stands in reference to the equally offensive telegraph and telephone wires. The one practical and efficient final remedy is an inclusive subway system for all kinds of conductors—steam, water, etc., as well as electricity.

Peat as a Gas Making Material.

The London *Journal* notes that an interesting article on peat and its utilization recently appeared in the *Organe Industriel de l'Eclairage* (the Belgian gas journal), from which the following abstract has been compiled. The question of utilizing peat in place of coal has been very seriously studied in France and the Low Countries, as they were formerly called, in consequence of the occurrence of immense deposits of the material in these regions, and the comparative inferiority of the native coal. Peat may be described as a kind of coal of recent formation, containing much water and earthy impurities, which is capable of producing gas more or less freely; the crude gas containing an almost unmanageable quantity of carbonic acid. The article now under notice has apparently been written with the object of calling attention once more to the potentialities of peat for gas making and other purposes. It must be confessed that the subject is almost hopeless; for many inventive geniuses have been discouraged and much money wasted in attempts to prepare peat fuel for general use in gas works and factories.

Subjected to distillation, peat gives a gas burning with feeble light, and an oily liquid from which a gas said to be four or five times more brilliant than coal gas is extracted. The mixture of these two gases gives a light equal to about three-fifths that of coal gas burnt under the same conditions. MM. Recce and Peigné-Delacour have sought to utilize the residual products of peat—such as the tars, from which may be extracted liquid hydrocarbons suitable for lighting, paraffin, wood spirit, and sulphate of ammonia. Peat begins to distil at 109° C., producing very little sulphuretted hydrogen. The liquor distilled over contains acetic and butyric acid and creosote. The production of tar is from 6 to 9 per cent. The residuum of the retorts contains about 6 or 8 per cent. of ash; and, being sufficiently compact, makes a useful fuel. When the coke or charcoal is powdery, it possesses, in a very high degree, the property of absorbing ammonia; and therefore it serves for the preparation of manure. For this purpose the charcoal is saturated with ammonia, and mixed with ashes of schists rich in sulphates and phosphates. Sometimes the peat ashes are used, without admixture of anything else, for lightening and improving soils.

Peat is worked in 31 departments of France. In 1880 the men engaged in this industry numbered 28,600; and 240,000 tonnes were produced from 867 pits. A capital of 3,000,000 francs is represented by this working. Besides its use in blocks, as a fuel, and in the form of coke, peat has been made to yield other products in the following proportions per 1,000 parts of the raw material:

	Kilos.
Charcoal	200
Small coke	100
Grain charcoal	50
Dust	50
Ammoniacal liquor	350
Benzene	4
Illuminating oil	6
Lubricating oil	22
Coloring bases	5
Phenic acid and creosote	6
Paraffin	2
Carbonaceous residue	5
Gas and loss	200
	1,000

From this table it appears that peat is rich in essential matters; and it is astonishing to the author of the memoir that since 1878 the general output of this material, capable of being adapted to so many uses, should have diminished rather than increased.

So far for the Belgian author; who, it must be admitted, has made out a good case for the utilization of peat. As, however, there is no economical or industrial fact, such as that mentioned in regard to the diminished use of peat, without its proper and sufficient explanation, the writer might have usefully concluded his remarks by offering his own views of the explanation in this case. As he has not done so, and lest it should be thought that the trade in peat is unduly suffering neglect at the hands of gas manufacturers and other large users of fuel, we will endeavor to supply the omission.

In the first place, it may be pointed out that the author himself admits that all the gas obtainable from peat, by a double distillation, is at best only three-fifths as good as coal gas produced at one heat. It is much to be feared that all the usable residual charcoal—which weighs altogether very little more than the gas—would not maintain the retorts at a sufficient heat for distilling such a watery material even once, to say nothing of the second operation of the same kind. And it must not be forgotten that with the second distillation—in which the whole of the illuminating oils, paraffin, and benzene would be gasified—the value of these residuals would also disappear. If they are turned into gas, it is very evident that they cannot also be realized as residuals. After the coke has been burnt for fuel, and the oily liquids converted into gas, the only real residuals would be some ashes, a little ammoniacal liquor, and some pitch. All the rest, which figures so largely in the Belgian writer's catalogue, would have gone to make a gas 40 per cent. worse than coal gas.

One need not look farther to understand why peat is not used for gas making. It is the development of French and Belgian coal mining that has thrown a shadow over the peat industry of the same countries. Peat will always find a considerable local sale for household purposes; but for nothing else while coal, of even passable quality, can be mined. For the purpose of ascertaining their commercial value, coal and peat may be described as the higher and lower varieties of the same thing. Coal is essentially a

very superior peat; and peat is a more or less imperfect and inferior coal. A great proportion of the coal raised in Eastern Europe is not much better than peat; while, on the other hand, the best peat of Ireland is an immeasurable distance from the worst coal of Wales or Scotland. To complain that a poor material is rejected in favor of a better, is the most unprofitable grumbling, whatever may be its object.

As we have now shown, therefore, the question of most importance in regard to the possible utilization of peat in gas manufacture or the kindred arts is, not whether the raw material contains gas, coke, tar, and the rest of the recited residuals, but simply how much of these, or of any one of them, in comparison with the known capabilities of coal. Examined in this light, it is abundantly evident that the differences between peat and coal, even of degree, are so seriously to the disadvantage of the former that its use in place of the latter is not within measurable probability.

The Electric Lighting of the Louisville (Ky.) Exposition Buildings.

By Benj. Rankin.

Although it may seem to come to you at a very late date, I propose, with your permission, to make a few statements in regard to the lighting of the Exposition Buildings and grounds during the fair which was held at Louisville, Ky., in the months of the fall season of 1883. In the course of these remarks I shall quote largely from the Official Report of the Jury on Awards.

The main building covered the space of about 11 acres of ground; other structures attached thereto, and the adjoining Park, will increase the area lighted to something over 20 acres. There were 4,810 incandescent electric lights installed to perform the work of lighting the main structure, 165 arc lights having been allotted to light the smaller buildings, as also the Park. The total lighting power of both the systems was estimated to be equivalent to 127,540 candles.

It will be proper here to state that the Judges on "Electricity as Applied for Various Purposes," were provided with a photometer room furnished with the latest and most approved instruments required for such description of work. The photometric tests of the incandescent lights were made with a Bunsen photometer and standard candle, with a consumption of two grains per minute; while the tests for the arc lights were made with the same instrument, modified by extending the bar to 50 feet, and by the substitution of an incandescent lamp for the candle.

In testing the incandescent lights a circuit of 315 lights was used—the point at which the lamps were attached for testing being an average point of the circuit. Fifteen lamps were tested; 5 of these were new, and the remainder were selected from the circuit at random—some at the feeders, and others at different distances from them. The results of the photometric tests were as follows:

Number 1	13.17	candles.
" 2	13.17	"
" 3	13.49	"
" 4	13.17	"
" 5	12.42	"
" 6	12.87	"
" 7	12.00	"
" 8	13.00	"
" 9	13.65	"
" 10	15 60	"
" 11	14.15	"
" 12	12.57	"
" 13	15.03	"
" 14	12.57	"
" 15	19.56	"

During the photometric tests four sets of cards were taken from the engine, and the average horse power was found to be 32.50. From the above data the following results were obtained:

Average horse power equal to	32.50
Number of lights in circuit	315
Average candle power	13.77
Number of lights per horse power equal to.	9.70
Number of candles per horse power, equal to	133.57

Arc Lights.

In this branch of the lighting there were two competing electric companies—the Jenney and the Thompson-Houston. The lamps in each case were chosen from the circuit tested. Cards were taken from the engine, and the circuit and fall in electro-motive force were measured, for each lamp, while the photometer tests were being made. From such data the light per horse power and the relative efficiency of the lamps in the two systems were obtained. The lamps, in each case, in the circuit, being the full capacity of the relative dynamos, according to the statement submitted by the companies.

Results.

	Jenney.	Thompson-Houston.
Total number of lights in circuit	16	12
Total horse power	26.920	11.795
Average horizontal light per lamp	596.46 c.	291 82 c.
Average horizontal light per horse power.	306.50 c.	296.90 c.
Relative efficiency of lamps from current and fall in electro-motive force	1.105	1.00

Four lamps were tested from each system, and each company was allowed to arrange its connections and circuits to the best possible advantage, representatives of each company being allowed to be present during the tests.

The light was quite satisfactory during the continuance of the fair—102 days. The matter of cost could not be determined; but the impression made on my mind was that the amount of capital necessarily involved, in the fitting up and establishing of the Edison plant alone, would be quite sufficient to build and equip at least four gas plants of equal lighting capacity, to say nothing at all about the large force of high-priced mechanics, electricians, experts, etc., required to ensure success.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

The Coal Tar Distillers Effect a Combination.—An Associated Press dispatch, dated December 19, possesses matter which will be of great interest to the gas fraternity of this country. The dispatch alluded to is as follows: "Cleveland, Ohio, December 19.—The coal tar distillers of the United States are holding a conference here. Those in attendance are Messrs. S. E. Barrett, Chicago, Ill.; J. D. Fletcher, New York; G. W Elkins, Philadelphia, Pa.; J. Sibley White, St. Louis, Mo.; Henry Gay, Cincinnati, Ohio; and Charles H. Connor, Louisville, Ky." This meeting is the sequel to the one recently held at the office of the New York Coal Tar Chemical Company, in New York city, which session was attended by representatives from 13 different firms from various parts of the country—Boston, New York, Philadelphia, Pittsburgh, Baltimore, Cleveland, Cincinnati, Chicago, Louisville, St. Louis, and New Orleans concerns sending delegates. Heretofore there has been somewhat lively competition in the matter of purchasing coal tar; but it now appears that the Cleveland conference was designed to put an end to such competition in the future. The details which have been received by us in relation to the last meeting are meagre in the extreme; but sufficient has transpired to show that arrangements were devised whereby parties to the combination expect to secure themselves from the necessity of paying higher prices for tar than those dictated by their own sweet will. While hoping to make their profits absolutely assured by the arbitrary fixing of prices for the crude product, they also expect, through another pooling arrangement of some description, to so advance the prices of some of the refined coal tar products as to add very greatly to the gross profits on the sales of the same.

It is evident, therefore, that while this combination remains intact the price of coal tar will be invariably fixed by the buyer—a circumstance which must certainly tend to lessen the peace of mind of the seller, and which will more than likely stir up the bile of the seller, perhaps, to the point when he will conclude to work up the tar himself. In this event the Cleveland conference will have itself to thank for bringing about such a result. Certain it is that this action clearly shows that the tar distillers of this country are in no way anxious to bring about the day when the American gas maker is to get, for this residual, an approximate price to that received by his English brethren—60 cents per ton of coal carbonized. Our contemporary, the London *Journal*, in the issue of November 27th, quotes tar as worth, at that date at Manchester, 45 shillings per ton, which would be equivalent to the figure given above.

It will be only reasonable to expect that the comparatively few contractors for, and purchasers of, ammoniacal liquor in this country will follow the example of the coal tar distillers. Perhaps they will wait a while before taking this step, in order that the workings of the tar combination, as to success or failure, may be made plain. The gas tar producers ought not to experience much trouble in making this scheme "boil over."

The Evansville (Ind.) "Consolidation" Elects its Board of Officers.—We noted the fact in our last issue that the Evansville Gas Company and the Evansville Electric Light Company agreed to join forces in a consolidation and mutual merging of interests. At the meeting of the board of directors, held Monday, December 10, in the parlors of the Evansville National Bank, the following officers were elected: President, F. J. Reitz; Vice-President, R. K. Dunkerson; Secretary, John B. Hall, Jr.; Treasurer, Samuel Bayard; Superintendent of electric light works, Geo. M. Hoag; General Manager of gas works, Jacob Weintz. From the names of these new officials it would seem as though the electric people had gained the

upper hand as far as the question of control of the board of officers is concerned.

THEY WOULD LIKE TO LIGHT EVANSVILLE, IND.—Right on the heels of the announcement that the above-named consolidation had been effected, comes the news that the "public benefactors" would like to obtain a foothold in Evansville's streets, not to say anything about the desire to make a "grab" at the pockets of Evansville's citizens The following petition was presented to the Common Council of that place, at the session of December 10th. It will be noticed that the "benefactors" have the old, familiar pleas advanced as reasons why they should be allowed to go ahead, and it will also be observed that Manager H. D. Fitch is still in the service. Here is the petition; our readers will recognize it as an old "friend:"

"To the Hon. Mayor and Board of Councilmen:

"Gentlemen—Your petitioners, the United Gas Improvement Company, of Philadelphia, Pa., and the Southern Gas Works Company, of Louisville, Ky., being large owners of gas works, and possessed of many valuable improvements for the manufacture of illuminating and heating gas made from superheated steam and petroleum, commonly called "water gas," do hereby petition your honorable body to grant them the privilege of erecting their system of works in your city, and opening up the streets and alleys as may be necessary to lay down conductors for the purpose of supplying citizens who may desire to use said gas, which conductors are to be put down in a substantial manner, and re-covered in good condition, subject to the approval of your honorable body.

"Your petitioners are of the opinion that the coal from the large deposit in and around your city can be used by them for fuel to good advantage, resulting in favor of a cheaper illuminant for your people. Our system of gas making is not new, but has been largely used in other cities, and is now being introduced because of late improvements, very rapidly. The cities of New York, Brooklyn, Baltimore, Toronto (Canada), San Francisco, New Orleans, St. Louis, Pullman, Lancaster and Harrisburgh, Pa., Patterson, N. J., Frankfort and Lexington, Ky., and many others are entirely and partially lighted with water gas, while many other places are now being piped by your petitioners for its use, which is an indication of progress. We believe the superior brilliancy of the light and its advantages, as a heating agent, will result in its general adoption by your citizens. Exclusive rights not granted others are not asked for, but simply to establish a "plant" in your city, giving your citizens choice of illuminants, believing results will secure a liberal patronage with fair dividends upon the investment.

"UNITED GAS IMPROVEMENT COMPANY,
"SOUTHERN GAS WORKS COMPANY,
"Per H. D. FITCH, Manager."

The "new improvements" clause is, we believe, about the "newest" thing in the phraseology of the petition, and the "entirely and partially lighted" reference is particularly definite, more especially the "entirely.' This "water gas boom" has undoubtedly made great strides of late—but, unfortunately for the patentees of the many systems, the strides have been taken in a backward direction.

This whole subject of granting the petition, and drawing up ordinances to govern the petitioners, was referred to the consideration of a special committee, and this committee was instructed to report back to the Council. The editor of the Evansville *Tribune News* does not appear to take kindly to the prayer of the petitioners, and suggests it would be prudent for this committee "to take ample time to get at the true status of the proposition, and then make a sensible report of the facts to the Council." He further states that it is time "the Council knew what buncumbe was," and suggests that "when it does see buncumbe to let it alone," winding up his remarks with the statement, "The Council should file notice on all 'buncumbites' that they had better take their chaff to a more gullible market. We have no doubt that future devolopments will corroborate our suspicion that there is nothing in the new gas company."

PERSONAL.—Mr. William Enfield, who has, for the past eleven years, been connected with the Indianapolis (Ind.) Gas Light Company in various capacities, recently resigned the position of assistant secretary to that company in order to assume the duties of superintendent of the Jackson (Mich.) Gas Light Company. Mr. Enfield brings with him to his new field of duty high testimonials as to worth and capability. Besides being thoroughly conversant with all the practical details of gas manufacture and distribution, Mr. Enfield possesses the additional advantages of being an excellent accountant and accomplished draughtsman. We wish him all possible success.

THE PHILADELPHIA (PA.) 1884 ELECTRICAL EXHIBITION.—The preparations for holding the proposed International Electrical Exhibition at Philadelphia, Pa., in the fall of this year, have so far progressed that rules and regulations have been prepared for the classification of the various apparatus. The different groups will consist of—First, apparatus for the production of electricity; second, electric conductors; third, measurements; fourth, applications of electricity, under which there are two sub-divisions, apparatus of large powers, and those of small powers; fifth, terrestrial physics; sixth, historical apparatus; seventh, educational and biographical. It is the purpose of the committee to make a notable departure from usual exhibition ideas, in not giving any medals or diplomas. If arrangements can be made by the committee for an unbroken water-front on the Schuylkill river, the method of placing an electric light of 100,000 candle power will be exhibited by the Ordinance Department of the United States Navy

A CLERGYMAN SUFFOCATED BY GAS.—At Baltimore (Md.) on Sunday, December 16, the Rev. George Morris, aged 75 years, a retired clergyman, who for many years officiated as a minister of the Presbyterian faith, came to his death through suffocation caused by the inhalation of illuminating gas at the residence of Mr. Thomas A. Reid, No. 136 Mulberry street. Rev. Mr. Morris was sitting in his apartment on the previous night (December 15) when Mr. and Mrs. Reid retired. Mrs. Reid, at about 8 o'clock on the following morning, rapped at the door, and, receiving no response, entered the room. The room was filled with gas, which was yet escaping from the burner. Mr. Morris was found lying in bed unconscious, though still breathing. Physicians were summoned, and every effort was made to revive him, but death ensued some hours afterward. The supposition is that the deceased, who was somewhat absent minded, blew out the gas. It is said that he had done this once before; but, on the previous occasion, the door of his apartment had fortunately been left open.

HE RECOVERED.—Patrick Magher, an employe of the Waterbury (Conn.) Gas Light Company, while attempting to remove a meter from the office of the District Telegraph Company, located in that city, neglected to shut off the supply before commencing operations, and, as a consequence, was overcome by the escaping gas. From the fact that discovery of his critical situation was quickly made, the physicians who were immediately summoned were enabled to restore him to consciousness.

WHAT THE GAS MEN ARE DOING AT ST. PAUL, MINN.—One of the most significant indications of the growth and prosperity of cities and towns is the degree of prosperity and advance attaching to the conditions of the gas supply. Should the town be peopled with men of energy and vim, it is, as a rule, safe to say that energy and vim will be characteristic of those in charge of the gas works; but should it by any queer *contretemps* so happen that old fogyish principles prevail in the gas management of a growing township, this prevalence will not be of long duration, and the opposition "rod in pickle" soon be availed of as the speediest means of convincing those most directly interested that one must "swim with the tide" in order to be abreast of the times. It is quite plain on the face of it that a well-lighted town argues prosperity on the part of its inhabitants; while, on the contrary, a poorly lighted town must just as readily show the reverse order of things. If a town is growing wealthy it can afford to pay for well-lighted streets. We need not tell our readers that St. Paul (Minn.) furnishes an excellent example of surprisingly rapid, and, at the time solid, and substantial, growth.

It has been said by some that St. Paul ought to be a good deal better lighted than it is—but those who make this assertion generally lose sight of the fact that the city's topography is peculiarly straggling. The lights are situated upon hill-tops, and in valleys, and scattered around in all sorts of nooks and corners.

Since General Sibley has had the principal management of the St. Paul gas works many important changes have been made, all of which have tended to very greatly increase their working efficiency. The mains have been largely extended, and the General has devoted a large portion of his time in seeing to it that St. Paul's citizens are provided with as good a gas service as it is possible to obtain; the manufacturing plant has been added to, street mains enlarged and extended, lamp posts of modern patterns have been erected at such points as were designated by the Council. Indeed, it would be a wise move on the part of the Council if they should order the erection of many more street lamps than those now in use. Could they be persuaded to so order, the result would be very beneficial to the ordinary gas consumer and the public, as such action would enable the gas company to make a decided reduction in its selling price.

General Sibley has been quite fortunate in securing the assistance of the valuable services of Mr. J. Atkinson, who, for a period of 14 years, was connected with the St. Louis (Mo.) Works, as also at a later period (if we mistake not) with the Consumers Company, of Chicago, Ills. Among the improvements lately made at St. Paul has been the erection of six new benches of "sixes," thus placing the company in position to maintain a maximum daily send out of 500,000 cubic feet. The present works are "10 inch," and during this year it is proposed to enlarge them to "16 inch." It is also proposed to increase the length of street mains by some 15 miles of pipe. It

should be added that a new holder, 66 feet in diameter, telescopic, 22 feet lift, with a capacity of 114,000 cubic feet, has also been erected. It may be noted that the company proposes to run a main across to Dayton's Bluff, it being a principle, no less than matter of policy, on the part of the company to follow up the growth of the city, no matter what direction that growth may take. During the past two years the company has expended about $75,000 in the establishment of extensions and improvements, and next year it is contemplated that twice this sum will be needed to carry out the plans now proposed. As the natural result of this wide-awake policy the consumption of gas has been increased by 50 per cent., and the company is kept continually busy putting in new meters in all parts of the city.

General Sibley, and his co-adjutor, Mr. Atkinson, are reaping the reward of their constant and unremitting attention to the wants of the gas consuming population of St. Paul, Minn.

Carry Out These Promises.—The Evansville Gas and Electric Light Company, in announcing to the gas consumers of that city the policy which is to govern its dealings with them, does the thing "up brown" in saying—

"The policy to be adopted by this company from the inception of its business admits the fact that success and prosperity must not depend solely upon the capacity, skill or genius of the company, but chiefly upon the consumers of gas; and it is therefore essential, and, in fact, the imperative duty of the company, to treat them at all times with that consideration which is due to them. With the views as expressed above, the public may feel assured, and the pledge of good faith is given, that the price of gas shall not at any time be increased, but that the tendency shall be toward a lower price; and whenever the development of the business of the company justifies it, a reduction in the price will voluntarily be made to all consumers. The consolidated company, therefore, claims reasonable time to demonstrate its readiness and ability to meet the just expectations of the public."

Now, then; let them keep up to these declarations, and they need not have much fear of Messrs. Fitch, *et al*,

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Changes in Chicago (Ills.) Gas Management.—At a recent meeting of the directors of the Consumers Gas Light and Fuel Company, of Chicago (Ills.), Mr. Charles E. Judson, was elected President and Engineer, Mr. W. S. Rayburn retiring. Mr. Judson comes to this management from the works at Scranton, Pa. It is to be hoped that Mr. Judson will have fewer cases of "blowing out the gas during his new tenure of office than he had at Scranton.

All the remaining positions were filled by the re-election of the incumbents for the past term.

Two More Deaths from Gas Suffocation at Scranton, Pa.—A despatch from Scranton, Pa., dated December 19, says that one of the nurses attached to the Lackawanna Hospital, of that city, was horrified, during a visit to the third floor of the building, to find Hiram Ehrgood and John Walsh, inmates of the institution, lying dead in their room, having been suffocated by illuminating gas inhaled during the night. The deceased men occupied two cots, but when the bodies were discovered Ehrgood was found lying, face downwards, on the floor, while Walsh met his fate in his bed. A small jet of gas had been left burning in the room, and the supposition is that one of the men blew it out before retiring. Walsh was admitted to the institution last October, suffering from typhoid fever, but was convalescent, and was merely permitted to remain there until he could find employment. Ehrgood had only been admitted to the hospital on the day before, and was being treated for a fractured arm. This is the fifth fatal case of gas suffocation that has occurred at Scranton within a comparatively short period. Dr. Gardner, the physician in charge at the hospital, says that he visits all the rooms of patients before retiring, but as Walsh had been in the place several months, and understood all about the gas, he did not think it necessary to visit the room on the night in question.

Looked at in Different Lights.—Quite a difference of opinion exists in the views of Prof. Morton and one of our own correspondents as to how the streets of Paris are illuminated at night, since the electric light has taken its departure from these thoroughfares. The one claims that the streets have gone back to "their pristine gloom," while our correspondent asserts that these same streets "are, if possible, more brilliant by night than by day." The fact is, however, that our correspondent is at present on "the scene of action."

Trying to Introduce the Edison Light at Chillicothe, Ohio.—Mr. C. B. Story, representing the Edison Electric Light Company, is engaged in an attempt to form a company for the purpose of introducing the Edison incandescent light at Chillicothe, Ohio. The capital stock of the proposed company has been placed at $50,000.

Massillon (Ohio) Gas Company Joins the "Reducers."—Mr. T. C. Hopper notifies us that the Massillon Gas Light and Coke Company, on January 1, 1884, reduced the price of gas to $2.50 per 1,000 cubic feet, to consumers using less than 3,000 cubic feet per month. A discount of 5 per cent. is allowed to consumers of from 3,000 to 4,000 cubic feet per month; 10 per cent. discount being granted on all monthly consumption which exceeds 4,000 cubic feet.

More "Blowing it Out."—The New York *Sun*, of December 25th, says that a smell of gas in one of the corridors of the Van Dyke House, 28 Bowery, New York city, on the morning of December 24, led to the forcing of the door of one of the rooms. Sanford Sheridan and George Smith were found unconscious in the bed to which they had retired some time before. The young men were from Trenton, N. J., and it is thought that, upon retiring for the night, either one of the parties "blew out the gas."

The Market for Gas Securities.

The continued strength of the city gas share market furnishes matter for congratulation among investors in this class of securities, and may be taken as the most positive evidence of the flourishing condition of our city companies. The leading feature in the market is, same as at last writing, Manhattan gas; this security is now quoted at 260 to 265, as against 245 to 250 a fortnight ago. We note a sale at auction, on December 19, of 27 shares Manhattan at 260., Metropolitan gas is very strong, we quote it at 203 to 206; last fortnight the figures were 195 to 200. New York gas holds previous quotation at a decided advance; bid 144, asked 146—last quotations 140 to 145. Mutual is again stronger and higher, being at 125 to 128; on December 19, $2,000 Mutual 5-20 bonds were sold at auction, bringing at the rate of 104¼. Municipal gas has recovered from the temporary weakness, mentioned in market report for December 17, and is now quoted at 194 to 196—the December 17 quotation showing the figures of 188 to 190. Harlem gas is somewhat stronger, we quote it at 115 to 118; on December 19, 150 shares of this security were sold at auction at 115¾. Equitable gas remains at about the same figures—90 bid, 94 asked.

Brooklyn gas shares are in a mixed condition as to quotations, although an upward tendency appears to show through the tide of values. Brooklyn gas we quote at 128 to 130; this will be noted as a marked advance in the bid price—the previous bid figure being 120; Williamsburgh gas is buoyant, our rates showing 115 to 120—in comparison with previous quotation of 107 to 112; Fulton Municipal we quote at 113 to 115; Citizens, 91 to 95—50 shares of this security, sold at auction December 27, brought 91; Peoples, 72 to 76; Metropolitan, 91 to 95—a recent sale at auction of 21 shares of this stock brought 91; Nassau, same as last at 75 to 80.

In out-of-town shares we note a considerable advance in Consolidated gas, of Baltimore, Md.

Correspondence

[The Journal is not responsible for the opinions expressed by correspondents.]

The Richmond, Va, Gas Works Improvements.

Office of Superintendent of the City Gas Works,
Richmond, Va., December 22, 1883.

To the Editor American Gas Light Journal:

Since the close of the bitter contest here between the water gas and the coal gas interests, by the awarding of the contract for the remodeling of our old gas works, we have been busy with our improvements, and have the gratification of realizing our expectations. We have erected a range of ten benches of "sixes;" set an additional Mackenzie rotary exhauster, a 30-horse power steam boiler and engine of superior workmanship, and a couple of 13′ × 21′ purifiers, with improved overhead carriage. Plans and specifications for all of the above were prepared and furnished by J. Anderson, Esq., of Taylor & Anderson, gas works builders, of Cincinnati, Ohio, to whom we are indebted for his personal supervision. The entire work exhibits a compactness and neatness which proves that it was constructed by a methodical engineer. We are now charging 300 pounds per mouthpiece, and getting a yield of over 50,000 cubic feet of gas per bench, from West Virginia coal.

The work, after a two months' trial, was turned over by Mr. Anderson, and received by the Committee on Light, on last Wednesday evening, the entire Committee expressing full satisfaction for the efficient manner in which he had completed his contract, and for his gentlemanly and liberal conduct throughout.

We are now able to manufacture more gas than the capacity of street mains will pass for consumption, to the enlargement of which we will next have to devote our attention. With these improvements we will be enabled to make a further reduction of 50 cents per thousand.

Wishing you a merry Xmas and a happy new year, I remain, with sentiments of high regards, Yours very truly,

John H. Knowles, Superintendent.